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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/613,559	07/02/2003	Hardayal Singh Gill	HIT1P015/HSJ9-2003-0118US	6848

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EXAMINER	
CHEN, TIANJIE	

ART UNIT	PAPER NUMBER
2656	

DATE MAILED: 03/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/613,559	Applicant(s) GILL, HARDAYAL SINGH	
	Examiner Tianjie Chen	Art Unit 2656	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Final Rejection

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinarbasi (US 2003/0179513) in view of Saito et al (US 2003/0011948).

Claims 1 and 9, Pinarbasi shows a magnetic head in Fig. 10, including: a free layer 202; an antiferromagnetic layer 216 spaced apart from the free layer; and an antiparallel (AP) pinned layer structure 204 positioned between the free layer and the antiferromagnetic layer and wherein the AP pinned layer structure includes antiparallel pinned layers 220 and 222 and an AP coupling layer 224 that are pinned through large magnetic anisotropy due to positive magnetostriction and small net moment for the antiparallel pinned layers ([0011]); wherein the antiferromagnetic layer provides a coercivity that enhances pinning of the AP pinned layer structure ([0011] and [0012]).

Pinarbasi does not state that the net magnetic moment of the pinned layer structure equals about zero and the thickness of the AP coupling layer and the thickness of the pinned layers are selected to provide a pinned layer structure field of at least 5/ or 10 KOe.

Saito shows an pinned layer structure, wherein the net magnetic moment equal to about zero ([0017]); and Saito also shows that the saturation field Hs is important

for maintaining AP coupling in the pinned layer structure ([0048]) and the saturation field can reach at least 900 KA/m=2π X 900 Oe = 10.8 KOe (Fig. 29). One of ordinary skill in the art would have been motivated to set the magnetic field of the pinned layer structure as taught by Saito for better maintaining AP coupling in the pinned layer structure.

Claim 7, Pinarbasi shows the antiferromagnetic layer is made of PtMn, which is the same material as used in this Application, which inherits a high positive magnetostriction.

Claim 8, Pinarbasi also shows that the AP pinned layer structure includes at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other, the pinned layers being separated by an AP coupling layer ([0016] and [0043]).

Claim 10, Pinarbasi also shows that the magnetic anisotropy of the AP pinned layer structure is oriented perpendicular to an ABS of the reading head ([0016]).

Claim 12, Pinarbasi further shows an in-stack bias layer 240, the bias layer stabilizing the free layer, the AP pinned layer structure stabilizing the in-stack bias layer ([0046]).

Claim 14, Pinarbasi shows that the head forms part of a GMR head.

Claims 15-17, Pinarbasi further shows that the head forms part of a CPP/or CIP/or tunnel junction sensor ([0064]).

Claim 33, Pinarbasi further shows a magnetic storage system in Figs 1-7 including: magnetic media; at least one head for reading from and writing to the magnetic media, each head having: a sensor having the structure described above, a

write element coupled to the sensor; a slider for supporting the head; and a control unit coupled to the head for controlling operation of the head.

Claims 4 and 5, Pinarbasi shows that the antiferromagnetic layer is constructed of PtMn having an exemplary thickness of 30 Å, it implies that the thickness is variable. Pinarbasi also shows a thickness of the antiferromagnetic layer 332. which has a thickness of 150 Å. It would have been obvious at the time the invention was made to one of ordinary skill in the art to choose a suitable thickness through experimentation, which would include the range of between about 50 Å and 100 Å / or 60 Å and 90 Å.

Claims 18, 21, and 24, as described above, Pinarbasi and Saito et al shows a magnetic head, including: a free layer, an antiferromagnetic layer spaced apart from the free layer, the antiferromagnetic layer being constructed of PtMn having a thickness of between about 50 A and 100 A /or 60 Å and 90 Å; and an antiparallel (AP) pinned layer structure positioned between the gee layer and the antiferromagnetic layer, wherein the AP pinned layer structure includes at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other through large magnetic anisotropy due to positive magnetostriction and a small net moment for the antiparallel pinned layers, the pinned layers being separated by an AP coupling layer; wherein the antiferromagnetic layer provides a coercivity that enhances pinning of the AP pinned layer structure; and the thickness of the AP coupling layer and the thickness of the pinned layers are selected to provide a pinned layer saturation field of at least 5/or 10 KOe.

Claims 2, 3, 6, 19, and 20; Pinarbasi shows the antiferromagnetic layer, which is made of PtMn, which is the same as disclosed in this Application; therefore, it should inherit a coercivity of at least about 300/400 Oe.

Claims 11 and 26, Pinarbasi shows a head as described above, does not specifically shows that the head is adapted to read from media having a bit density of at least about 200 Gbit/in.

However, applicant claims that his head is adapted to read from media having a bit density of at least about 200 Gbit/in without disclosing particular features directly for reaching this specific density. Pinarbasi shows a head having same structure as described above. One of ordinary skill in the art would have been reasonably expect that can also be adapted to read from media having a bit density of at least about 200 Gbit/in.

Claim 22, as described above, Pinarbasi shows that the antiferromagnetic layer has a high positive magnetostriction.

Claim 23, Pinarbasi further shows that in Fig. 10 that the pinned layers are constructed of at least CoFe and the AP coupling layer is constructed of at least Ru.

Claim 25, as described above, Pinarbasi shows that the magnetic anisotropy of the AP pinned layer structure is oriented perpendicular to an ABS of the reading head.

Claim 27, as described above, Pinarbasi shows that the head includes an in-stack bias layer, the bias layer stabilizing the free layer, the AP pinned layer structure stabilizing the in- stack bias layer.

Claims 29-32, Pinarbasi further shows a head as recited in claim 18, wherein the head forms part of a GMR head/CPP/CIP/tunnel junction sensor ([0064]).

Claim 34, Pinarbasi shows in Figs. 1-7 a magnetic storage system, including: magnetic media; at least one head for reading from and writing to the magnetic media, each head having: a sensor having the structure as described above, a write element coupled to the sensor; a slider for supporting the head; and a control unit coupled to the head for controlling operation of the head.

Claims 13 and 28, Pinarbasi shows in Fig 9 a head including a bias layer 140 formed along a track edge of the head, the bias layer stabilizing the free layer.

Applicant also does not disclose any advantage of using this bias and only discloses as an alternative. It would have been obvious at the time the invention was made to one of ordinary skill in the art to includes bias as an alternative; it has some disadvantage, but is not excluded.

Response to Arguments

2. Applicant's arguments filed 01/18/2006 have been fully considered but they are not persuasive.

- Applicant argues: in p.8 that Saito actually teaches AP pinned layer structures that have a net magnetic moment that is purposely made to be not about zero. And then Applicant traverse the rejection.

  Examiner's position: (1) Saito teaches in [0017] that the magnetic moment of the first pinned magnetic layer 112 cancels the magnetic moment of the second pinned magnetic layer 114. It clearly shows that the pinned layer structure starts with zero net magnetic moment. (2) the net magnetic moment introduced by the next step is a spontaneous magnetic moment, which is recognized in the art as a tiny amount of even is amplified. Applicant has not clearly defined the term "about zero," since is an amplified tiny amount it is "about zero." (3)

"Having a net magnetic moment" is the principle forming the pinned layer structure for it can function in the sensor. If the net magnetic moment equals zero without any net magnetic moment, the pinned layer structure will have no function at all in the sensor. (4) Applicant states in his specification: "a net moment of the pinned layers is about zero, and the AFM layer adds coercivity to reduce the probability that the magnetization of the pinned layers will flip to another orientation. This new structure provides enhanced pinning of the pinned layer and prevents flipping of the magnetic orientations of the AP pinned layers." It clearly shows that in Applicant' has purposely made the net magnetic moment of the pinned layers being is only "about zero," but not zero. The purposely made net magnetic moment may flip and an AFM layer is needed to prevent the net magnetic moment from flipping.

- Applicant argues in p.11: "the lower end of the claimed range (50Å) is almost *twice as thick* as Pinabasi's exemplary thickness."

  Examiner's position: in rejection Examiner has given a range of 30Å - 150Å.

Conclusion

3. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date

of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tianjie Chen whose telephone number is 571-272-7570. The examiner can normally be reached on 8:00-4:30, Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Nguyen can be reached on 571-272-7579. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TIANJIE CHEN
PRIMARY EXAMINER